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Evaluation of Karnofsky Performance Scale as a Postsurgical Prognosis Criteria in Chronic Subdural Hematoma Cases: Discordance Between Clinical and Radiological Outcomes

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Abstract

Background: Chronic subdural hematoma (CSDH) may cause neurological deficits as well as adverse effects on the patient's general health status. Although CSDH cases are diagnosed in the advanced age group with a very high rate, clinical findings may not be related only to CSDH. The aim should be related to clinical recovery rather than radiological recovery for these cases. We aimed to evaluate Karnofsky's score as a measurement criterion of postoperative clinical outcomes in patients with CSDH.

Methods: Cases operated for the diagnosis of CSDH were defined retrospectively. The cases that had been operated with this diagnosis were identified by examining the institution database records. Karnofsky scores equivalent to clinical status were performed by examining patient files. Karnofsky scoring before the symptomatic period was determined and compared with the Karnofsky score belonging to the late postoperative period. The clinical and radiological findings of the preoperative and postoperative periods were compared. Independent samples *t* test was used to reveal the difference between the two groups.

Results: Data of 184 cases were evaluated. Seventy-three cases were operated on the left, 51 cases on the right, and 60 cases bilaterally with the diagnosis of CSDH. Burrhole exploration was performed in 119 cases, and a craniotomy was performed in 65 cases. Although a significant decrease in hematoma thickness was detected radiologically in cases operated with the craniotomy method, a more significant improvement was observed in Karnofsky's score in cases operated with the burrhole method. In younger patients, improvement in Karnofsky's score was significantly higher.

Conclusion: The main aim should be to improve clinical status rather than radiological improvement in the treatment of CSDH cases. In the surgical treatment of these cases, it is possible to encounter a high rate of complications depending on age. It is possible to evaluate the postoperative status rationally with Karnofsky scoring. According to the preoperative Karnofsky scoring, deciding on the surgical technique may help reduce complications.

Keywords: Chronic subdural hematoma; Intracranial hemorrhage; Karnofsky performance status; Subdural hematoma; Subdural hematoma surgery.

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Introduction

Chronic subdural hematoma (CSDH) cases are among the most frequently diagnosed and surgically performed intracranial hemorrhage cases in neurosurgery clinics. A complete correlation between hematoma thickness and clinical status in these cases cannot be established.[1-3] Since the symptoms are usually atypical, non-specific, and slow-progressing, radiological diagnoses can be made in the late period. Atypical complaints are defined as dizziness and decreased daily activities, not neurological deficits related to raised intracranial pressure. Most of the cases are diagnosed after non-comatose clinical status.[4]

As most of these patients are of advanced age, their quality of life is inevitably lower than the quality of life of younger patients due to age and chronic diseases. For the same reasons, surgical comorbidity is expected to be high.[4-6] Complete improvement in quality of life is not always expected in the postoperative period.

Karnofsky's scale is one of the rational markers for evaluating general health status and quality of life, especially in elderly patients.[5,7-10] The pre- and postoperative Karnofsky's score in patients with CSDH allows the quantitative evaluation of the operation type decision and postoperative recovery. In this study, we aimed to show the results of pre- and post-operative status with Karnofsky scoring. With this method, it is aimed to show that it can be a guide in the selection of the surgical technique to be applied to the cases in the

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preoperative period.

Materials and Methods

Cases diagnosed with CSDH who underwent surgery during 2013-2021 were evaluated in the study. The data of the cases who were operated with this diagnosis were determined by scanning the terms "chronic subdural hematoma" in the institutional database. Outpatient clinic and service records were examined, and evaluation criteria were determined retrospectively. An Excel database was created, and the patients' age, sex, and demographic data were recorded. Computed tomography (CT) and magnetic resonance imaging (MRI) images were obtained from the database of the picture archive and communication system (PACS) system of the institution.

Data related to CSDH were entered into the same database. For the preoperative Karnofsky's score evaluation, Karnofsky's scores were determined by evaluating the clinical findings of the cases as long as they were asymptomatic. The side of CSDH, preoperative hematoma thickness, applied surgical method, discharge time, Karnofsky score at discharge, findings at the first postoperative clinical control and Karnofsky's scores, and the latest postoperative period and Karnofsky scores were recorded.

The cases were evaluated in four age groups (50-60, 60-70, 70-80, and 80+years old). The patients were divided into groups with unilateral and bilateral CSDH, and cases operated as burr-hole or craniotomy, and statistical comparisons were made. The study excluded cases whose late-term clinical and radiological follow-ups were not performed, and sufficient data could not be obtained.

Statistical Analysis

SPSS software, version 22, was used for statistical comparisons between the groups. Paired sample *t* test was used to determine the differences between the groups operated with burrhole or craniotomy. Independent samples *t* test was used to reveal the difference between the two groups. The *WinAutomation* Tool was used to reduce repetitive computer operations. This software created macro files, and repetitive computer operations were automated.

Results

In this study, 184 patients meeting the study criteria were identified. The mean age of the cases was 69.54±7.11, 128 cases were male, and 56 cases were female. Sixty cases were operated bilaterally, 51 were on the right, and 73 were on the left with the diagnosis of CSDH. Preoperative MRI examination of 135 cases is also available; septated subdural hematoma was detected in 54 patients. It was determined that the patients' chief complaint was dizziness. Subdural hematoma associations seen with the primary complaints of the cases are shown in Table 1. The time elapsed between clinical symptoms and diagnosis was approximately 3.13±1.53 weeks.

One hundred nineteen cases were operated with the burrhole method, and 65 cases were operated with the craniotomy method. The craniotomy method was preferred in patients with extensive septations or a significant volume of the acute bleeding component. The mean preoperative Karnofsky's score of all cases was 78.97±13.85; in the latest period (2.68±0.97 months), Karnofsky's score average was 68.75±13.51.

The lowest preoperative Karnofsky's score was found in the 80+age group. The most minor decrease in Karnofsky's score after the operation was in the 50-60 age group; the highest decrease was recorded in the 80+age group ($P=0.003$). When evaluated as a surgical technique, a decrease in Karnofsky's score was 13.23±9.54 in the group operated on by craniotomy. A decrease of 8.57±8.37 points was observed in the group operated with burrhole. According to age groups, the cases' preoperative and postoperative Karnofsky's scores are shown in Tables 2 and 3.

The improvement in Karnofsky's score was calculated to be lower in patients who had been operated on both sides with the burrhole method than in the group that had been operated on unilaterally. The discharge time was 4.87±1.74 and 6.60±2.33 days for those operated with burrhole and craniotomy, respectively.

Discussion

Karnofsky's score is mainly used to evaluate the general health status and quality of life before the treatment is applied in patients with malignancy.[9-13] It is used to predict the clinical status of patients before and after treatment,

Table 1. Clinical Symptoms and Signs, Hematoma Sides and Thicknesses

	Left CSDH (n=73)	Right CSDH (n=51)	Bilateral[a] CSDH (n:54)	Hematoma Thickness
Dizziness (n=121)	47	36	38	15.26±2.70
Headache (n=107)	43	32	32	15.77±2.71
Focal deficit (n=36)	16	14	6	16.94±2.16
GKS<15 (n9)	4	2	5	

Abbreviations: CSDH: chronic subdural hematoma; GKS, glasgow coma score.
[a] For bilateral subdural hematoma, the average of the largest thicknesses of both hematomas was recorded.

Table 2. Karnofsky Score Averages and Changes in Preoperative and Late Follow-ups by Age Group

Age Groups (y)	Preoperative Karnofsky Score	Postoperative Late Karnofsky Score	Difference
>80	67.06±13.11	51.76±8.09	15.29±9.43
70-79	74.36±10.67	64.00±9.54	10.36±9.61
60-69	82.38±13.76	72.67±12.65	9.71±8.60
<60	92.86±7.56	88.57±6.90	4.29±5.34
Overall	78.97±13.85	68.75±13.51	10.22±9.05

Table 3. Karnofsky Score Averages in Preoperative and Late Follow-ups by TYPE of Surgery

Age Group (y)	Burrhole Pre-operative	Burrhole Post-operative	Craniotomy Pre-operative	Craniotomy Post-operative	Burrhole Pre-operative-Post-operative Difference	Craniotomy Pre-operative-Post-operativeDifference
>80	65.00±10.49	50.00±6.32	68.18±14.71	52.73±9.05	15.00±5.48	15.00±10.87
70-79	74.00±10.00	66.80±10.30	74.67±11.37	61.67±8.34	7.20±9.36	13.00±9.15
60-69	81.46±13.89	72.68±12.38	86.11±12.43	72.78±14.47	8.87±8.22	13.33±8.40
<60	91.67±7.53	86.70±5.16	86.67±16.33	76.67±16.33	5.00±5.48	10.00±12.65
Overall	79.58±0.68	71.00±13.05	77.85±14.20	64.62±13.47	8.57±8.37	13.23±+9.54

according to the side-effect profile of the treatment to be applied according to this scale.[7,10,11] Patients with CSDH are mainly in the older age group and their general health status and quality of life are lower than in younger cases. symptoms and findings are usually associated with atypical findings such as dizziness and headache rather than focal neurological deficits and comatose findings in this case group.[1,2,6] Age-related factors such as a history of chronic disease and polypharmacy also negatively affect the quality of life.[14,15]

Clinical progression in these cases is relatively slow compared to other intracranial hemorrhage cases. They present with symptoms due to decreased cerebral blood flow on the cortical surface rather than raised intracranial pressure, which may be related to the width of the hematoma volume.[1,2,6] Therefore, focal deficits and coma findings are lower compared with other intracranial hemorrhage cases. Clinical findings are associated with the diagnosis of CSDH and the combination of other age-related diseases.

In these cases, cerebral atrophy is high depending on age, and it plays the most critical role in the pathogenesis of CSDH.[1,5] Chronic disease history, cardiovascular disease history, antiaggregant-anticoagulant use, and polypharmacy rates are also relatively high.[1,2,4] For this reason, evaluating the clinical status in CSDH cases should not be considered only with the findings related to CSDH. Karnofsky's score criteria, which are associated with quality of life, are directly related to the clinical status of this age group, independent of CSDH.[5,7,8] Therefore, the clinical goal in operated CSDH cases is not the postoperative maximum Karnofsky score. Karnofsky's score must be achieved before the symptoms, and signs of CSDH appear.

Currently, the burrhole hematoma drainage method is most commonly used in the surgical treatment of CSDH cases. However, the craniotomy method can also be preferred in multicomponent or septated CSDH cases in radiological examinations. However, the craniotomy method is inevitably more invasive than the burr-hole method. It should be considered that there may be adverse effects on the Karnofsky score in both complications and technique. It should be kept in mind that recurrent CSDH may occur, especially in cases where cerebral atrophy is evident, by predicting that the subdural space will not be closed entirely. Parenchymal expansion will not ultimately

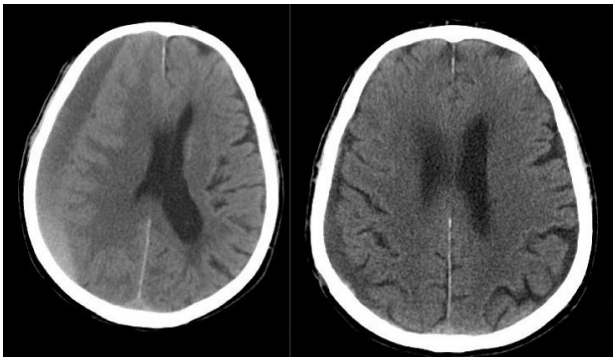

Figure 1. In a case with a preoperative Karnofsky's score of 80, the same Karnofsky's score could be obtained despite a residual hematoma in the postoperative CT examination

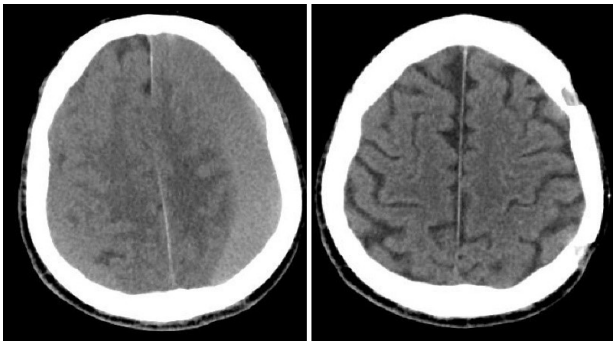

Figure 2. In a case with a preoperative Karnofsky's score of 70, postoperative dysphasia and a lower Karnofsky's score (40) were encountered, although parenchymal expansion was fully developed in the postoperative CT examination

occur (Figures 1 and 2). For this reason, considering the harmful effects of this method on Karnofsky's score, in cases where aggressive surgical treatment is considered, more selective treatment can be applied.

In patients who underwent craniotomy, Karnofsky's Score in the late postoperative control was 64.62±13.475, and in those operated with burrhole it was 71.00±13.05 (Tables 3 and 4). Although the postoperative hematoma thickness is less in the craniotomy method, the postoperative late Karnofsky's score was significantly lower (Table 2). Although postoperative hematoma thickness is detected less in patients operated with the craniotomy method, thicker hematoma recurrence can also be accepted, and the burrhole method can be preferred.[9,16,17] The aim should be to provide the highest possible quality of life and, therefore, Karnofsky's scoring

Table 4. Results of Preoperative and Postoperative Hematoma Thicknesses in Cases Operated With Burrhole and Craniotomy Method

	Pre-operative Hematoma Thickness	Post-operative Hematoma Thickness	Difference
Burrhole	15.28 ± 2.42 mm	4.04 ± 1.13 mm	3.19 ± 1.88 (times decreased)
Craniotomy	15.90 ± 3.11 mm	3.35 ± 1.34 mm	4.65 ± 2.95 (times decreased)

in the postoperative period rather than radiological recovery. The goal of expectancy in the quality of life in the postoperative period should be equal to the quality of life in the asymptomatic periods. In these patients, preoperative performance scale evaluation should be considered the optimal level for the goal of post-treatment recovery.

It is unclear how thick a recurrent hematoma will begin to become symptomatic on a case-by-case basis. Therefore, although the radiological recovery rate is predicted to be lower, it should be taken into account that the clinical results obtained from more minimally invasive approaches may be better in this group of cases.

Limitations of the Study

Since the patients were the elderly, their comorbidities are high. Cases are more likely to have a single or combined chronic disease history, depending on age. Due to these criteria, it should also be considered that the case groups cannot show completely homogeneous characteristics.

This study cannot be conducted prospectively for Karnofsky's scoring because before the diagnosis of CSDH is made, we are not able to know which cases will receive this diagnosis. The information obtained from the patients and their relatives about their medical history was evaluated for the preoperative Karnofsky's scoring. For this reason, it may not be expected that the scoring performed with the information obtained from the subjects and their relatives will be completely objective and free from bias.

Focal neurological deficits may also be seen, regardless of the extent of the hematoma in CSDH cases. Especially if a focal neurological deficit occurs with isolated injuries of eloquent areas, this deficit may also affect Karnofsky's scoring. For this reason, isolated neurological deficits (such as dysphasia and plegia) should not be considered in Karnofsky's scoring.

Conclusion

Clinical findings in CSDH cases are not always associated with hematoma thickness. Even after more invasive surgery, recurrence is common. Deciding on the type of operation according to Karnofsky's scoring provides a rational evaluation in the preoperative and postoperative clinical evaluation of the cases. Whichever surgical method is preferred, Karnofsky's scoring in patients with CSDH provides analytical data in evaluating the treatment of the cases since clinical results are more critical than radiological results.

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Competing Interests

The authors have no personal, financial, or institutional interest in any drugs, materials, or devices described in this article.

Ethical Approval

The Ethical approval for this study was obtained from the Clinical Research Ethics Committee of Kırşehir Ahi Evran University (code: 2022-14/125).

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